

fact, a seal. An iron plate was prepared with a facing of turpentine, wax, and the ashes of burnt paper. Over this was placed an iron frame, in which the clay types were set up until it was full. The whole was then sufficiently heated to melt the wax facing. An iron plate was placed above the types, making them perfectly level, the wax being just soft enough to allow the types to sink into it to the proper depth. This being done it would be possible to print several hundred or thousand copies with great rapidity. Two forms prepared in this way were ready for the pressman's use, so that when he had done with one he would proceed with another without delay. Here is undoubtedly the principle of the printing press of Europe, although western printers can dispense with a soft wax bed for types and can obtain a level surface without this device. Perhaps the need of capital to lay in a stock of types, the want of a good type-metal easily cut and sufficiently hard, and the superior beauty of the Chinese characters when carved in wood have prevented the wide employment of the movable types which are so convenient for all alphabetic writing. The inventor of this mode of printing in movable types five centuries before they were invented in Europe was named Pi Sheng.

THE manner in which the Chinese Government render the popular deities subservient to political ends has been noticed by Sir Alfred Lyall in a paper in the *Fortnightly Review* in the beginning of the present year. In a recent *Peking Gazette* we find an instance of how a deity is raised in rank for presumed public services. The military governor of Urumtsi prays the Emperor to confer a tablet on the deities of a mountain in his district, in recognition of various acts of supernatural interposition. In this mountain there is a large lake of unfathomable depth, upon the waters of which the inhabitants of the whole surrounding country rely for the irrigation of their lands. Of recent years, however, it appears the springs had shown signs of exhaustion, and much anxiety has been felt on this account. Last year a temple, dedicated to the divinities of the mountain, was erected, and scarcely had it been completed when the water in the lake rose more than a hundred feet, and has ever since afforded an unfailing supply of water. The assistance of these deities has been invoked with unvarying success on many occasions when locusts threatened to devastate the country, or when snow was urgently needed for the protection of the crops. The memorialist thinks that important services such as these should not go unrequited, and he begs therefore, in accordance with the expressed wish of the inhabitants, to address the Emperor on the subject. His Majesty replies graciously conferring the suggested tablet on mountain divinities.

THE Vienna municipal authorities have established a number of regulations for persons wishing to manœuvre a balloon. They are obliged to prove that they have gone through a course of instruction with a competent aeronaut, and have executed by themselves a number of successful ascents. Persons desirous to be passengers in a balloon are obliged to procure an authorisation from their wife and children, if any.

THE additions to the Zoological Society's Gardens during the past week include two Macaque Monkeys (*Macacus cynomolgus* ♀ ♀) from India, presented by Mr. A. Cornet; a Common Paradoxure (*Paradoxurus typus*) from India, presented by Sir Louis S. Jackson, F.Z.S.; a Golden Eagle (*Aquila chrysaetos*) from Hudson's Bay, presented by Capt. Hawes; five Delaland's Geckos (*Tarentola delalandii*), four Millipedes (*Yolus*, sp. inc.) from Teneriffe, two Sharp-headed Lizards (*Lacerta oxycephala*) from Madeira, presented by Mr. A. D. Bartlett; a Galeated Pentonyx (*Pelomedusa galeata*) from South Africa, presented by Mr. W. A. Watkins; two Black Wallabys (*Halmaturus ualabatus*) from New South Wales, a Dormouse Phalanger (*Dromicia nana*) from Tasmania, a Grand Eclectus (*Eclectus*

grandis) from Moluccas, a Red-sided Eclectus (*Eclectus polychlorus*) from New Guinea, purchased; a Rufous Rat Kangaroo (*Hypsiprymnus rufescens* ♂), a Squirrel-like Phalanger (*Belidens sciureus* ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN

THE OBSERVATORY AT CHICAGO.—We have received from Professor G. W. Hough his annual report as director of the Dearborn Observatory at Chicago, for the year 1882. It is mainly devoted to the reduction and discussion of the numerous series of observations on the spots upon the disc of the planet Jupiter, made with the 18½-inch refractor, including measures for position of the great red spot, of equatorial white spots and other markings, and angles of position of the equatorial belt. The observations extend over the period from September, 1879, to March, 1882. Those made in 1879 and 1880 showed that the red spot was retrograding with accelerated velocity, and this drifting has continued with such uniformity, that Prof. Hough considers "the position of the spot at any future period can be very accurately computed." It was found that all the observations could be fairly represented by a period of rotation, varying directly with the time, and the discussion leads to the following formula:—

$$1879, \text{ September } 25 + t \times 0.00209s.,$$

which gives 9h. 55m. 35.9s. for the mean period between September 25, 1879, and March 29, 1882, comprising 916 days, or 2214 rotations of the planet.

Hence it is inferred that the apparent rotation-period has increased about four seconds since the opposition of 1879, showing a total drift of the red spot in longitude of 40,000 miles; and Prof. Hough regards his observations as evidence that the great red spot is not the solid portion of the planet. "An immense floating island," nearly 30,000 miles in length, and more than 8000 in breadth, has "maintained its shape and size, without material change, during more than three years." He has failed to recognise any fading of the colour of the spot, which on February 2 in the present year he judged to be a light pink, as formerly. Although the dimensions of the spot may not be said to have materially changed, the micrometrical measures do indicate a diminution in length to the extent of 0".95 between the oppositions of 1879 and 1881, at which latter epoch it was 11".30 (reduced to Jupiter's mean distance).

The direction of the south edge of the equatorial belt was nearly parallel with the planet's equator, as given in Marth's ephemeris; the north edge of this belt was found to be slightly concave.

The elliptical white spots were more numerous in 1882 than previously; but with the exception of two situate south of the red spot, they were seen with difficulty, and were only measurable under best vision. The two spots named were observed systematically during the three months from November 21, 1881, to February 23, 1882. The following of the two appeared to be at rest relatively to the red spot from November 22 to December 6, and subsequently to drift in the direction of rotation to the extent of about 41"; the average drift during the last two months was at the rate of fifteen miles per hour. The preceding spot also did not retain the same relative position in longitude with respect to the great red spot. Prof. Hough adds: "The observations of the small white spots during 1880 and 1881 prove that the whole surface of the planet outside the margin of the equatorial belt rotates with nearly the same rate." The approximate rotation-period for the principal white spot between the edges of the great equatorial belt was 9h. 50m. 9.8s. from observations over more than eight months, which is the same as for the second spot observed during 1880. Hence these equatorial white spots drift in the direction of the planet's rotation, at about 260 miles per hour, or through a complete revolution in about 45 days.

Twelve tinted drawings of the appearance of the disc of Jupiter accompany the report. The first of two made on July 3, 1880, shows the second satellite just entering on the great red spot at 15h. 43.5m., and the other, made nine minutes later, shows it nearly over its centre. A notch was formed so soon as the satellite touched the end of the red spot, and when completely entered, it appeared as white as when outside the planet's disc.

Mr. S. W. Burnham, who was at the Washburne Observatory

during the summer of 1881, has returned to Chicago, and has recommenced his valuable measures of double stars with the large refractor. The present report has an engraving of this instrument, and of the tower of the Dearborn Observatory, in which it is mounted.

COMET 1882 *b* (FINLAY, SEPTEMBER 8).—The following positions of this comet are deduced from the elements published in NATURE last week:—

At 18h. Greenwich M.T.									
R.A.			Decl.			Log. distance from			
h. m. s.						Earth.		Sun.	
Oct. 19	10	13 22	...	15	7' 3	...	0'1592	...	0'0466
21	10	10 39	...	15	54' 2	...	0'1613	...	0'0640
23	10	7 53	...	16	40' 4	...	0'1633	...	0'0804
25	10	5 3	...	17	26' 0	...	0'1651	...	0'0959
27	10	2 8	...	18	11' 0	...	0'1666	...	0'1106
29	9	59 7	...	18	55' 5	...	0'1679	...	0'1247
31	9	55 59	...	19	39' 6	...	0'1690	...	0'1382

CHEMICAL NOTES

MM. HAUTEFEUILLE and CHAPPUIS have obtained what appears to be pure liquid ozone, by compressing a mixture of oxygen and ozone at 125 atmospheres, and cooling the end of the capillary tube by a jet of liquid ethylene: on suddenly releasing the pressure, a drop of a very deep indigo-blue liquid remained in the end of the tube. The gas above this liquid was colourless, but as the last traces of liquid evaporated, the gas was seen to have a blue colour (*Compt. rend.* xciv. 1249).

It is well known that sulphuretted hydrogen produces little or no precipitate in an aqueous solution of arsenious oxide: according to the experiments of Messrs. H. Schulze (*Journal für pract. Chemie*, 2, xxv. 431), such a liquid contains a colloidal form of arsenious sulphide. This colloid may be completely separated from dissolved arsenious oxide by prolonged dialysis; the solution, if dilute, is scarcely changed by long-continued boiling; the presence of free acids or of such soluble salts as chloride of potassium, iron, or chromium induces a change of the colloidal into an insoluble form of arsenious sulphide.

By strongly compressing phosphoretted hydrogen in presence of water, and then suddenly decreasing the pressure, M. Cailletet has obtained a crystalline hydrate of this compound, the existence of which is conditioned by the temperature and pressure; the critical point, *i.e.* the temperature above which the substance cannot exist, whatever be the pressure, is 28°. Hydrates of sulphuretted hydrogen and of ammonia have also been obtained by this method (*Compt. rend.*, xciv. 58).

By a somewhat similar process, M. Wroblewski has obtained a solid crystalline hydrate of carbon dioxide, $\text{CO}_2 \cdot 8\text{H}_2\text{O}$: the experimental results of this author seem to show that at the pressure required to cause the absorption of carbon dioxide by water in the proportion indicated by the formula $\text{CO}_2 \cdot \text{H}_2\text{O}$, the water would be entirely frozen, and therefore that this hydrate cannot be obtained by this method (*Compt. rend.*, xciv, 1355).

"WHEN solution of two salts, capable of mutual action, are mixed, the solution contains four salts": it has hitherto been difficult to give a direct experimental proof of this generalisation made half a century ago by Berthelot. In the last number of the *Berichte* of the German Chemical Society (15, 1840) Herr Brügelmann describes the following experiments designed to prove the justness of Berthelot's statement:—Equal volumes of cold saturated solutions of cobalt chloride and nickel sulphate are mixed and allowed to deposit crystals by evaporation at ordinary temperatures; the crystals contain cobalt and nickel, but combined with sulphuric acid only. A mixture of solution of cobalt chloride and copper sulphate, prepared similarly to the preceding, deposits sulphate of the two metals almost free from chlorides. Copper sulphate and potassium dichromate solutions when mixed deposit crystals consisting almost entirely of sulphates of copper and potassium, the second crop of crystals contain a little chromate of the two metals, and the final crop is nearly free from sulphates.

THE "Compagnie Generale des Cyanures et Produits Chimiques" of Paris have issued a small pamphlet explanatory of the various technical applications of the salts known as sulphocyanates, which can be now readily manufactured in a state of purity. Sulphocyanate of aluminium is used as a mordant in

alizarine dyeing; sulphocyanate of copper in the preparation of aniline black, and also, along with potassium chlorate and antimony sulphide, in the preparation of matches; sulphocyanate of potassium may be employed as a refrigerating material, as during the solution of 130 parts of this salt in 100 parts of water, temperature is lowered through 34°; sulphocyanate of ammonium is more effectual, weight for weight, as an antichlor, than hypsulphite of soda.

INVESTIGATIONS conducted at the Baden Aniline and Soda Works show that the change of orthonitrophenyl propiolic acid into indigo, which (as already explained in this journal) has been for the most part effected by grapes or with sugar, can also be produced by the agency of sulphides, sulphhydrates, polysulphides, thiocarbonates, and especially the alkaline xanthates (*Chemisches Centralblatt*, 1882, 366).

GEOGRAPHICAL NOTES

NEWS has been received from the expedition of Dr. Emil Riebeck, dated July 7 last. It will be remembered that Dr. Riebeck, together with Dr. Schweinfurth made a thorough investigation of the island of Socotra, which was of high scientific importance. After this task was accomplished, the travellers separated, and Dr. Riebeck crossed to Bombay, travelled through large tracts of the Himalaya Mountains, remained for some time in Cashmere, then passed through the Ganges land, investigated Ceylon, and eventually undertook a special and detailed examination of the coast district of Aracan. He ascended the Karnasuli River from Tschittagong as far as the Hill tribes, to which Prof. Bastian has drawn special attention. He made many measurements, took numerous photographs and plaster casts of this highly interesting tribe, which is still living in a most primitive natural state. The climate, however, and particularly the frequent fording of rivers, soon told upon Dr. Riebeck's health. He contracted a fever, and had to be taken to Singapore. His valuable collections of zoological, anthropological, and ethnological specimens duly attracted the attention of geographers, and were frequently referred to at the recent "Geographentag." Since then Dr. Riebeck has continued his journey. Starting from Singapore, he is to follow the eastern coast of the Asiatic continent, then to cross over to Australia and New Zealand, and finally to return to Europe next summer by way of San Francisco and Panama.

To the Berlin Geographical Society the other evening, Major von Mechow gave some account of his explorations during the last year or two in the region of the Coango. Leaving Berlin in September, 1878, accompanied by a ship's carpenter and a gardener, Major von Mechow arrived at Dundo on the Coanza in the following January; but, owing to various difficulties, it was the beginning of 1880 before he could start northwards into the interior at the head of 115 native carriers. Crossing and re-crossing the Cambo, and passing through various powerful and hospitable tribes, the German traveller, after a thirty-seven days' march, at last reached the Coango on July 19, 1880, and, under the guidance of the great chief Tembo Aluma, visited the magnificent Succambundu waterfall, which he named after the Emperor William. After canoeing it on the Coango for twenty-five days, Major von Mechow made a detour to pay his respects to the great Muene Putu Kassongo, by whom he was received in great state, and returning on September 19 to the river, he followed it to longitude 5 deg. 5 min., from which point the fear of his followers of the neighbouring cannibals compelled him to return. In forty-five days he again reached the abode of Kassongo, where he stayed some time, and at last arrived on February 20, 1881, at Malange, where he met his returning countryman, Dr. Buchner, as well as Herr Pogge and Lieut. Wissmann, who were both starting on a similar tour of exploration.

A GERMAN edition of Amici's "Morocco" has been published by Hartleben of Vienna. Herr von Schweiger-Lerchenfeld is the editor, and has to a considerable extent remodelled the work, adding interesting ethnographical and historical notes, and omitting passages and references which in the original work can only interest Italian readers, on account of their purely private and local character. Its scientific value is also considerably increased. Two new chapters have been added, one on Southern Morocco, the other on the war between Spain and Morocco in 1860, and these are not the least attractive ones in the book, quite apart from the geological interest attaching to